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SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE • JANUARY 2, 1943

Gliders in War

See Page 7

A SCIENCE SERVICE PUBLICATION

Do You Know?

The greatest number of *cactus* species grow in Mexico.

Terpineol, obtained from turpentine, has an odor resembling lilacs.

Only 1.5% of the *steel* production of 1943 will go into consumer products.

Research shows that if *cows* are fed and milked three times a day instead of twice, milk production will increase 10% to 25%.

Seventy-three new *standards* were set up in 1942 by the American Standards Association, and 49 existing standards were revised.

A recent survey reveals abundant *fish* resources in the Caribbean area, which could be used to increase U. S. food supplies.

The highest concentration of *carbon monoxide* in airplanes is found during descent, as this poisonous gas enters through cracks and openings in the wing section.

Peacetime prediction: Non-rust, flexible screens of *nylon,* in which a hole made by a sharp-pointed pencil can be closed merely by rubbing the fingers over the displaced strands.

American farmers are harvesting from 400 to 500 acres of *belladonna* this year, to replace supplies of this important drug plant formerly imported from central Europe.

Moderate exercise may increase the amount of *air* inhaled as much as 400%.

Scorpions cannot sting themselves to death, since they are immune to their own poison.

Ferrets, apparently susceptible to the *common cold,* make good subjects for research.

The "dazzle" *camouflaging* of ships is not done for disguise, but to deceive the periscope observer as to the ship's course.

If *formaldehyde* is made slightly alkaline, a mixture of sugars called formose is obtained.

For the first time since 1935 and the second time in history, the Hawaiian Board of Health recorded no deaths from *diphtheria* last year, in spite of the war.

The invention of *laminated* paper grew out of the knowledge that two sheets of wrapping paper, glued together, possess different qualities of strength and appearance than either possesses separately.

Question Box

Page numbers of Questions discussed in this issue:

Most articles which appear in SCIENCE NEWS LETTER *are based on communications to Science Service, or on papers before meetings. Where published sources are used they are referred to in the article.*

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GENERAL SCIENCE

Langmuir's Address

Effect doesn't follow cause, says retiring A.A.A.S. president in radio address; while divergent phenomena give opportunity for individual action.

➤ BECAUSE science now finds that effect does not necessarily follow cause, Dr. Irving Langmuir, speaking as retiring president of the American Association for the Advancement of Science, called for the use of common sense, judgment, experience and intuition, in solving human problems, including the winning of the war.

"A sense of morality and decency, although not scientific, may be a major factor in winning the war," Dr. Langmuir said, in speaking from Albany on Dec. 26 over the Columbia Broadcasting System under the auspices of Science Service to thousands of scientists throughout the nation who forewent their traditional Christmas meetings to ease the transportation difficulties.

Two types of natural phenomena must be recognized, Dr. Langmuir said. One of these is the basis of classical physics. In "convergent phenomena" what happens can be determined and predicted from the average behavior of the parts that make up a system. The older ideas of cause and effect come in this realm.

The new idea of nature, that upsets conventional logic, is that a single discontinuous event, even a single minute quantum charge of electricity, becomes magnified in its effect so that the behavior of the whole actually depends upon something that started very small indeed. Dr. Langmuir calls this class of happenings "divergent phenomena" and these can best be understood on the basis of the quantum theory of modern physics.

Applying these observations to everyday living, Dr. Langmuir declared, "I can see no justification whatever for teaching that science proves that general causes (convergent phenomena) dominate in human affairs over the results of individual action (divergent phenomena).

"The mistaken overemphasis on convergent phenomena in human affairs, and the reliance on so-called scientific methods, has been responsible in large degree for much of the cynicism of the past few decades."

Dr. Langmuir, Nobelist in chemistry and associate director of the General Electric Research Laboratory, was introduced by Dr. Arthur H. Compton, Nobelist of the University of Chicago, president of the American Association for the Advancement of Science. Dr. Compton spoke from Chicago.

"It is not always recognized," said Dr. Compton, "that the total effect of science is to bring about conditions which favor world cooperation and thus tend to eliminate war. The growth of science and technology needs specialists. These specialists make an effective society only as long as their work is coordinated. Thus science demands a highly coordinated, cooperative society. Where men do not work together in cordial relations, the tools of science cannot be used effectively. It is thus that science emphasizes the strength of a society in which men work together with mutual good-will."

Science News Letter, January 2, 1943

Science, Common Sense And Decency

By DR. IRVING LANGMUIR

➤ UP TO the beginning of the present century one of the main goals of science was to discover natural laws. This was usually accomplished by making experiments under carefully controlled conditions and observing the results. Most experiments when repeated under identical conditions gave the same results.

The scientist, through his own experiments, or from previous knowledge based on the work of others, usually developed some theory or explanation of the results of his experiments. In the beginning this might be a mere guess or hypothesis which he would proceed to test by new types of experiments. If a satisfactory theory is obtained which seems in accord with all the data and with other known facts, the solution or goal of the investigation was considered to have been reached.

A satisfactory theory should make possible the prediction of new relationships or the forecasting of the results of new experiments under different conditions. The usefulness of the theory lies just in its ability to predict the results of future experiments. The extraordinary accomplishments of the great mathematical physicists in applying Newton's laws to the motions of the heavenly bodies gave scientists of more than a century ago the conviction that all natural phenomena were determined by accurate relations between cause and effect. If the positions, the velocities and the masses of the heavenly bodies were given it was possible to predict with nearly unlimited accuracy the position of the bodies at any future time. The idea of causation, or a necessary relation of cause and effect, has long been embedded in the minds of men. The recognized responsibility of the criminal for his acts, the belief of the value of education, and thousands of words in our language all show how implicitly we believe in cause and effect. The teachings of classical science, that is, the science up to 1900, all seem to reinforce this idea of causation for all phenomena.

Philosophers, considering many fields other than science, were divided in their opinions. Many went so far as to believe that everything was absolutely fixed by the initial conditions of the universe and that free will or choice was impossible. Others thought that cause and effect relations were mere illusions.

From the viewpoint of the early classical scientist, the proper field for science was unlimited. Given sufficient knowledge, all natural phenomena, even hu-

DR. IRVING LANGMUIR

man affairs, could be predicted with certainty. Ampere, for example, stated that if he were given the positions and velocities of all the atoms in the universe it should be possible theoretically to determine the whole future history of the universe. Practically, of course, such predictions would be impossible because we could never hope to get the necessary knowledge nor the time to carry out such elaborate calculations.

A little later scientists developed the kinetic theory of gases according to which the molecules of a gas are moving with high velocity and are continually colliding with one another. They found that the behavior of gases could be understood only by considering the average motions of the individual molecules. The particular motion of a single molecule was of practically no importance. They were thus taught the value of statistical methods, like those which insurance companies now use to calculate the probable number of its policy holders that will die within a year.

The theories or explanations which were developed in connection with the natural laws usually involved a description in terms of some kind of a model. In general, instead of thinking of the whole complex world we select only a few elements which we think to be important and concentrate our minds on these. Thus, the chemist developed the atomic theory according to which matter was made up of atoms of as many different kinds as there are chemical elements. These were thought of as small spheres, but no thought was given as to the material of which they were made. When later theories indicated that these atoms were built up of electrons and positive nuclei this made very little difference to the chemist, for he had not needed previously to consider that aspect of the model.

Material Unimportant

High school boys today are asked to build model airplanes. These must be of such shape that the different types of airplanes can be recognized when the profiles of the models are seen against a white background. It naturally is not particularly important just what kind of material is used in constructing them. Airplane designers build model airplanes to be studied in wind tunnels but these do not need to be provided with motors.

Most of the models which the scientist uses are purely mental models. Thus, when Maxwell developed the electromagnetic theory by which he explained the properties of light he thought of a medium through which these waves travelled. This was called the ether. It was supposed to have properties like those of elastic solid bodies. The reason for this choice of a model was that at that time the average scientist had been taught in great detail the theory of elasticity of solid bodies. Thus the magnetic and electric fields could be understood in terms of the familiar elastic properties. At the present time relatively few students are well trained in the theories of elasticity. The situation is thus reversed and today we explain the properties of elastic solids in terms of the electrical forces acting between their atoms.

Every student of geometry constructs a mental model when he thinks of a triangle. The mathematical lines that bound the triangle are supposed to have no thickness. In other words, they are stripped of any properties except those that we wish particularly to consider.

Equation Is a Model

Most of the laws of physics are stated in mathematical terms, but a mathematical equation itself is a kind of model. We establish or assume some correspondence between things that we measure and the symbols that are used in an equation, and then, after solving the equation so as to obtain a new relation, we see if we can establish a similar correspondence between the new relation and the data obtained from an experiment. If we succeed in this we have demonstrated the power of the mathematical equation to predict events.

The essential characteristic of a model is that it shall resemble in certain desired features the situation that we are considering. On this basis we should recognize that practically any theory has many arbitrary features and has limitations and restrictions imposed by the simplifications that we have made in the development of the theory, or the construction of our model.

Beginning with Einstein's relativity theory and Planck's quantum theory, a revolution in physical thought has swept through science. Perhaps the most important aspect of this is that the scientist has ceased to believe that words or concepts can have any absolute meaning. He is not often concerned with questions of existence, he does not know what is the meaning of the question, "does an atom really exist?". The definition of atom is only partly given in the dictionary. Its real meaning lies in the sum total of knowledge on this subject among scientists who have specialized in this field. No one has been authorized to make an exact definition. Furthermore, we cannot be sure just what we mean even by the word exist. Such questions are largely metaphysical and in general do not interest the modern scientist. Bridgman has pointed out that all concepts in science have value only insofar as they can be described in terms of operations or specifications. Thus, it doesn't mean much to talk about length or time unless we agree upon the methods by which we are to measure length and time.

For many years, up to about 1930, the new physics based on the quantum theory seemed to be fundamentally irreconcilable with the classical physics of the previous century. Through the more recent development of the uncertainty principle, developed by Bohr and Heisenberg, this conflict has now disappeared. According to this principle it is fundamentally impossible to measure accurately both the velocity and the position of any single elementary particle. It would be possible to measure one or the other accurately but not both simultaneously. Thus it becomes impossible to predict with certainty the movement of a single particle. Therefore, Ampere's estimate of the scope of science has lost its basis.

Probability Fundamental Factor

According to the uncertainty principle which is now thoroughly well established, the most that can be said about the future motion of any single atom or electron is that it has a definite probability of acting in any given way. Probability thus becomes a fundamental factor in every elementary process. By changing the conditions of the environment of a given atom, as for example, by changing the force acting on it, we can change these probabilities. In many cases the probability can be made so great that a given result will be almost certain. But in many important cases the uncertainty becomes the dominating feature just as it is in the tossing of a coin.

The net result of the modern principles of physics has been to wipe out almost completely the dogma of causation.

How is it then that classical physics has led to such definite, clean-cut laws? The simplest answer is that the classical physicist naturally chose as the subjects for his studies those fields which prom-

(*Turn to page 12*)

BIOLOGY

Sex Control Accomplished

Breeding experiments at Iowa State College have resulted in offspring of a strain of fruit flies all of which are males.

➤ PRENATAL CONTROL of the sex of animals, most elusive of all goals of experimental biology, has now been accomplished in the case of fruit-flies, those favorite insect "guinea pigs" of genetical research. Results of breeding experiments at Iowa State College, in which all offspring of a strain of the flies are males, are announced (*Science*, Dec. 18) by Dr. John W. Gowen and Dr. Ronald H. Nelson. Previous work by another researcher had already succeeded in producing a nearly all-female progeny in the same insects.

The method used was entirely that of the modern Mendelian geneticist, and did not involve the use of chemicals, X-rays or any of the other drastic means resorted to in attempts to predetermine the sex of larger animals and human beings. It consisted in selecting strains of fruit-flies in which the sex-determining chromosomes also carried a lethal gene, or genetic factor that would kill the individual bearing it before it reached maturity. Thus a lethal gene attached to the chromosome setup for femaleness would eliminate all females, leaving only male offspring to grow up.

Since this method involves the absolute control of mating for a number of generations it is obviously not applicable to human beings. It may eventually become useful in livestock breeding; but this has not yet been done.

Science News Letter, January 2, 1943

NUTRITION

Horse Meat Won't Hurt

If it is passed by Federal inspectors, it is safe and nourishing. But even if you want it, you probably can't get much. It's scarce.

➤ A TEMPEST in the frying pan, if not the teapot, seems to have been stirred up over the use of horse meat as a substitute for now scarce beef. Reports are that the use of horse meat is being urged in some places, while in at least one state its sale for human consumption is banned.

Actually, the supply of horse meat is so small that whether you like to eat it or not, you probably will not be able to get much if any, nor is there enough to help reduce the meat scarcity situation.

Latest figures from the U. S. Bureau of Animal Industry show that in the last year, when more than 50,000,000 swine were slaughtered under federal meat inspection, more than 18,500,000 sheep and lambs, and about 17,000,000 cattle and calves, only 30,000 horses were slaughtered.

If federally inspected horse meat is for sale at your butcher's, you can buy and eat it with confidence that it is safe just as is the other federally inspected meat you have been used to eating. Look for a green hexagonal (six-sided) stamp on federally inspected horse meat. The round purple federal inspection stamp is not used for horse meat.

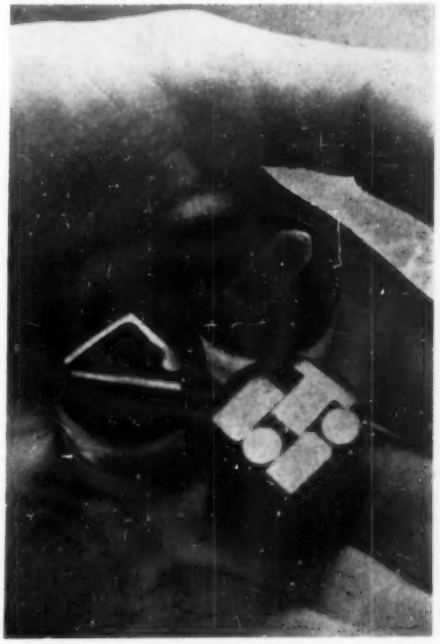
The nourishing quality of horse meat is probably about the same as that of other meats. Few studies have been made on this subject, but one authority states that horse meat does not differ materially in composition from beef except that it contains a relatively high amount of glycogen, the carbohydrate stored in animal tissues.

Horse meat is said to have a sweetish flavor and to be rather tough. The toughness is due to the fact that the supply comes chiefly from wild horses on western ranges, slaughtered to prevent their using up valuable cattle and sheep pasturage, and from worn-out work horses. Beef from old draught cattle, it is known, is not nearly so tender and good as that from young steers raised specially for food.

Horse meat is no novelty on the dinner tables of European countries, but in the United States its chief use has been for feeding animals in zoos, menageries, silver fox farms and in dog food. Some American horse meat formerly was shipped to France where the people are accustomed to eating this kind of meat.

Reluctance on the part of most Americans to eat horse meat, despite shortage in other kinds of meat, may be basically a religious prejudice, stemming from an old, nearly-forgotten need on the part of recently converted Christians in north European lands to distinguish themselves from their still-heathen neighbors.

In pre-Christian days the horse was a sacred animal in northern European countries. The legendary heroes or demigods of the pagan Saxons, Hengist and Horsa, were anthropomorphized horses. (The meaning of "Horsa" is obvious enough, and "Hengst" is still the modern German word for stallion.) The two names have persisted in isolated seaboard parts of Germany near the re-



FOR TEST—A rivet, a screw and an extruded part are prepared for microscope inspection by being embedded in bakelite, polished to mirror finish and etched with acid to bring out the grain. A faulty grain structure, as revealed in this way, will betray low-grade material or faulty processing methods so important to reject in airplane manufacture. This is an official photograph of the Office of War Information.

gions whence the Angles and Saxons came to England: The carved horse heads on the beam-ends of some of the old farmhouses are still called Hengist and Horsa by the peasants, who have no idea of their origin.

Eating horse flesh in those early days therefore was equivalent to partaking of a heathen sacrament—something that no good Christian could do, especially if he had only recently been converted from paganism and had to be careful about backsliding.

It is worth noting, as supporting evidence for this hypothesis, that in the south of Europe, where there is no prejudice against eating horse meat, the horse never was a sacred animal.

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MEDICINE

Ask Aid for Alcoholics

Editors of Military Surgeon appeal to company officers to help in making reliable soldiers of chronic drunkards. Give four rules.

➤ HELP THE alcoholic to stop drinking, is the appeal addressed to company officers and non-commissioned officers by editors of the *Military Surgeon* (December), official journal of the Association of Military Surgeons of the United States.

To make reliable soldiers of the chronic alcoholic or periodical drunkard, the editors say, officers' cooperation is vitally necessary. They recommend the following simple rules formulated by Lieutenant Colonel S. Alan Challman and Major Merrill Moore of the Army Medical Corps.

1. Remember that the heavy drinker lacks self-confidence, no matter how cleverly he hides his feelings of inferiority. He needs encouragement, with criticism presented in as friendly a way as possible. Show confidence in him and make him feel part of a team.

2. Explain to him that alcohol is poison to him, as strawberries or lobster may be poison to somebody else. The alcoholic should never take even one drink. Substitutes should be encouraged and there is no reason for his friends riding him if he orders milk.

3. Gain the cooperation of non-commissioned officers. A junior officer should get these ideas across to the sergeant. Even one heavy drinker in a company can cause a lot of damage.

4. Encourage other personal satisfactions. The alcoholic has never learned how to relax without liquor. Encourage some sport or hobby at which he can at least hold his own, or let him feel there is one thing he can do better than somebody else, whether it is doing the manual of arms, playing checkers, or pitching horseshoes. Remember that he has probably always been poor at games and a poor mixer, with men or women, due, probably, to his basic sense of inferiority.

If all these measures fail and the soldier drinks anyway—well, his officer can at least give him some advice. Eat before drinking, sip long drinks instead of gulping concentrated cocktails, never drink straight or from a bottle.

The medical officers making these suggestions do not expect any miracles but they say the above principles are the best way for junior officers to handle these administrative problems.

"The proper management of these problems," they conclude, "will reflect the junior officer's efficiency and aid in the conservation of trained manpower."

Science News Letter, January 2, 1943

BIOLOGY

Clams Keep Shut Against Pull Lasting for Days

➤ JUST HOW tightly do clams and oysters "clam up" when they are disturbed? Experiments reported in *Science* (Dec. 4) by Prof. A. M. Reese of West Virginia University indicate that these bivalves are able to keep their shells shut against pulls amounting to scores of times their own weight, and to endure these pulls for days on end.

Prof. Reese was interested particularly in the problem of how a starfish is able to get oysters and clams to open their shells wide enough to let the starfish thrust its stomach into the shell (a messy habit the starfish has) and digest the poor mollusks right in their own strongholds. He did not solve this problem, but he obtained some highly interesting data on the "shutting-up" strength of the bivalves' shell muscles.

He made small notches in the shells of oysters and clams with a carborundum wheel. Into these notches he inserted small hooks, and applied traction by means of weights on lines passed over pulleys, meanwhile keeping the shellfish alive in a salt solution approximating sea water.

He used weights ranging from about two pounds to more than eight pounds (900 to 4,000 grams), and kept the mollusks under tension for as much as five days on end. Some of them opened their shells slightly, others not at all, even after this long pull. One oyster, after being under a pull of more than three pounds for 48 hours, was suddenly subjected to greatly increased pull, but resisted until the tension went up to 22 pounds, yielding only when its shell-closing muscle was torn apart.

Prof. Reese points out that his experiments were performed under far from favorable conditions for the oysters and clams. They had been out of their natural environment for some time. He suggests that it would be "interesting to test the strength of perfectly fresh specimens under normal, sea conditions."

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ASTRONOMY

Nova Puppis Is In Our Own Galaxy

➤ EVIDENCE that Nova Puppis was expanding at the rate of 620 miles per second on Nov. 11 was obtained by Milton L. Humason and Dr. Roscoe F. Sanford from measurements on spectrograms taken with the 100-inch reflector of the Mount Wilson Observatory. The photographs showed broad bright spectrum lines of hydrogen, presumably in the expanding shell surrounding the nova, together with dark absorption lines of ionized iron and silicon.

On the following morning the spectrum of the nova was photographed at the coudé focus of the 100-inch telescope by Dr. Walter S. Adams. This is the first time the spectrum of a nova has ever been photographed on so large a scale. These plates showed the spectrum lines fainter than on the previous day.

From the intensity of dark lines in the spectrum of the nova produced not in the atmosphere of the star but by interstellar gases, Dr. Sanford has been able to make an estimate of its distance. He believes that Nova Puppis is a bright galactic nova and not a "sub-normal super-nova" as was first supposed.

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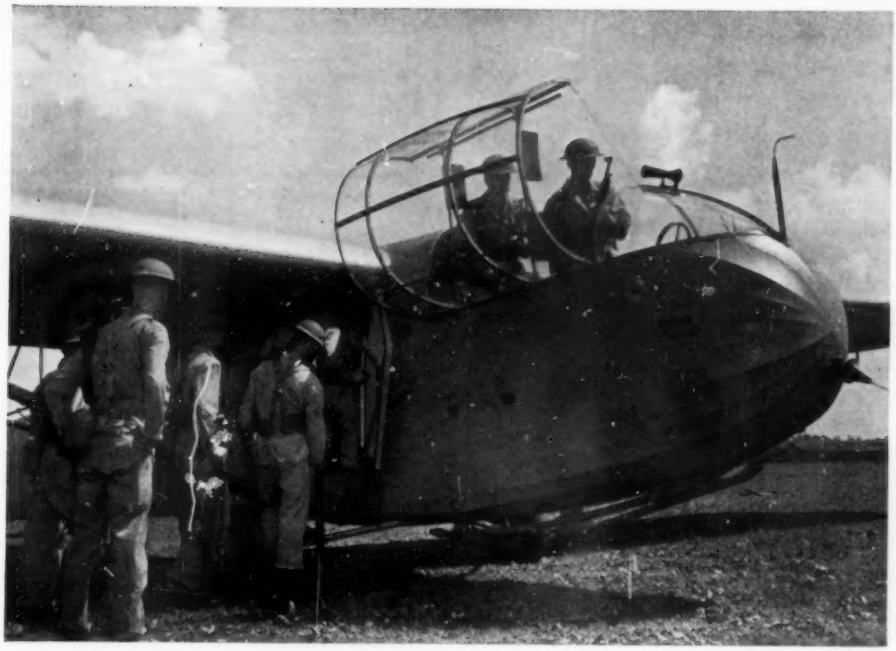

MISSION ACCOMPLISHED—Troops board a glider ready for the pick up.

ASTRONOMY

Comet Is Approaching

Orbit computed by discoverer of new Whipple Comet shows that it will pass within 50,000,000 miles of the earth in January. Can't be seen without aid.

➤ THE NEWLY discovered Whipple comet will pass within 50,000,000 miles of the earth some time in January.

An orbit computation by its discoverer, Dr. Fred L. Whipple of Harvard College Observatory, showed also that the comet, despite its nearness, will not achieve practical visibility with the naked eye.

The comet is currently traveling along with the earth in its orbit around the sun. The comet will be nearest the sun and pass the perihelion point in its orbit on Feb. 6, at which time its distance from the sun will be 1.35 astronomical units. Since an astronomical unit is the distance from the earth to the sun or 93,000,000 miles, the comet's distance from the sun will then be about 125,000,000 miles.

The comet's orbit is inclined only 20 degrees to the plane of the earth's orbit, which is a relatively small inclination as comets go. It is traveling in the same direction as the earth, from west to east around the sun, whereas many comets are found which move in the opposite direction.

Inasmuch as the orbit computed is parabolic rather than elliptical, it can not be told at present how much time is required for the comet to go completely around its orbit. Nor can the eccentricity or ovalness of the orbit be stated, even though it is practically certain that the finally determined orbit of this comet will be an ellipse. It is customary for astronomers to consider orbits of comets parabolic, as the portion of the orbit of a comet on which it is usually seen is practically the same as a parabola even if the orbit is actually an eccentric ellipse.

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ASTRONOMY

Periodic Comet Wolf I Rediscovered at Mt. Wilson

➤ FIRST SIGHT of periodic Comet Wolf I, expected to become visible in large telescopes early in September, 1942, was obtained by Dr. Walter Baade on Nov. 5 with the 100 inch reflector of the Mt. Wilson Observatory.

Previous attempts to locate this faint object had evidently failed owing to the fact that its observed position as determined from measurements on Dr. Baade's photographs differed from that predicted in the Handbook of the British Astronomical Association by as much as 13 diameters of the full moon. On the other hand, the positions predicted by M. Kamienski of Warsaw which Dr. Baade used in his search for the comet required only a small correction.

The photographs show the comet with a starlike head and small tail. Its magnitude on Nov. 5 was 18.6—far too faint to be caught except with the most powerful instruments.

Comet Wolf I was discovered on Sept. 17, 1884, by Max Wolf of Heidelberg. Its period at present is 8.3 years but its motion may be greatly altered by the disturbing influence of Jupiter and Saturn. It was a close approach to Jupiter in 1875 that changed the comet's path to such an extent that it could later be seen from the earth.

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AERONAUTICS

Glider Pickup May Be Tried in 1943 Combat

See Front Cover

➤ THE ARMY's new method of pick up for troop-carrying gliders may be tried out in combat effectively during the coming year.

The official Army Air Forces photograph on the front cover of this week's SCIENCE NEWS LETTER shows troops leaping from the glider in position ready to charge in attack.

The accompanying photograph on this page shows how the men are loaded onto the engine-less craft.

Science News Letter, January 2, 1943

● RADIO

Saturday, January 9, 1:30 p.m., EWT.

"Adventures in Science," with Watson Davis, director of Science Service, over Columbia Broadcasting System.

Dr. Charles W. Bray, of the National Research Council, will tell "How To Use Your Eyes at Night."

Monday, January 4, 9:15 a.m., EWT; 2:30 p.m., CWT; 9:30 a.m., MWT; and 1:30 p.m., PWT

Science at Work, School of the Air of the Americas over the Columbia Broadcasting System, presented in cooperation with the National Education Association, Science Service and Science Clubs of America.

"Worlds Begin" will be the subject of the program.

FORESTRY

Trees with High Rosin Yield Being Propagated

➤ PINE TREES selected for their high yield of rosin and turpentine, as choice rubber trees are selected for high latex yield, are now being propagated by workers of the Southern Forest Experiment Station, it is announced by three Station staff members, H. L. Mitchell, C. S. Schopmeyer and K. W. Dorman, (*Science*, Dec. 18).

In field tests leading up to the experiments, thousands of slash pine trees were examined and their yield of gum carefully determined. Twelve trees, that for some unknown reason produced two to three times as much as the average, were selected. Cuttings were made from them, which after a considerable period of initial failure, were finally induced to produce roots through a complex treatment with growth-promoting chemicals.

"It is reasonable to believe," the researchers comment, "that the development of high-yielding stands would contribute greatly to the solution of production problems which have long troubled the $25,000,000 a year naval stores industry, which supports some 50,000 workers and their dependents."

Science News Letter, January 2, 1943

NUTRITION

Nutritional Conditioning For War Workers

➤ NUTRITIONAL CONDITIONING of those in the population who are likely to become workers in war plants has been advised by the Committee on Nutrition in Industry of the National Research Council. This advice was based partly on experience in Great Britain, Dr. Robert S. Goodhart, U. S. Public Health Service officer, told members of the American Dietetic Association.

In England it was found that volunteers rejected for the army could be conditioned at a physical development depot in six months. In accomplishing these results optimum diet, sleep, hard physical work and healthy recreation were combined. Extra milk and fruit were added to the presumably good army ration. As a result, 87% of the rejected men were accepted and passed into the army.

In our own country it has been found that many now working in war industries had previously been unemployed for some time and the change to fairly long hours of concentrated toil imposed a heavy strain. The nutritional state of one group of new industrial workers was examined by a WPA group in New York City. Over 40% of the grown-ups of both sexes were found to be deficient in the amount of vitamin C in their blood. A number had a low blood cell content and were low on hemoglobin, the red coloring matter of the blood. This indicated they had not been getting enough iron in their food. Only one out of the entire group of 165 was completely normal as far as vitamin A was concerned.

A study of the diets of 1,100 workers in Southern California showed that over half did not get enough green and yellow vegetables and nearly half ate too few citrus fruits and tomatoes. Almost all ate enough lean meat but about one-third failed to get enough milk and a fifth were low in eggs consumed.

Science News Letter, January 2, 1943

ENTOMOLOGY

Soldiers and Workers Now Protected from Dog Flies

➤ U. S. Department of Agriculture entomologists have discovered three ways to beat the dog flies (*stomoxup calcitrans* L.) that menaced soldiers and construction workers at camps in coastal areas.

The methods are: spraying marine grass with dilute creosote oil; dipping celery waste, and burying peanut litter. The shoal and turtle grass on the shores of bays and sounds, the litter left after baling peanut vines for hay and the dump piles of waste strippings from celery washing plants all had previously been "fly factories."

Dog flies do not carry disease to man, but their painful, stinging bites are enough of a nuisance to reduce efficiency 20 to 25%, according to a statement from the U. S. Department of Agriculture. Since the fly population has been reduced, contractors report increased efficiency of workers and estimate a savings at two camps alone of about $500,000.

The dog fly is a serious pest to cattle, which is why the agriculture scientists started to battle it. In 1939 owners of livestock in one coastal area reported that one-fifth of their cattle died from loss of blood, hunger and weakness that resulted from annoyance by this pest. In efforts to escape the flies, cattle rush into the mud and water of swamps, and become mired so that they are often unable to free themselves.

Science News Letter, January 2, 1943

IN SCIENC

GENERAL SCIENCE

Carnegie Allocated More Than Half Million for War

➤ MORE than half a million dollars, constituting nearly 20% of its year's total grants of $2,831,650, have been allocated by the Carnegie Corporation of New York for activities directly related to the war, it is disclosed in Walter A. Jessup's first annual report as president.

The war-dedicated grants amount to $533,565. The largest single item, $100,000, has enabled the Joint Army and Navy Committee on Welfare and Recreation to conduct a variety of experimental programs as a basis for the activities of the Special Service Division of the War Department. Other grants included $75,000 to the Red Cross, $50,000 to the United Service Organizations, and $12,500 to the American Council on Education.

Science News Letter, January 2, 1943

NUTRITION

Cattle Receive Aid From Bacteria in Digestion

➤ HOW CATTLE and sheep are aided by bacteria in digesting the crude fiber of the grass and fodder they eat has been demonstrated by a new technique devised by F. Baker of the Guilford County Technical College, in England. Mr. Baker's method is described in a statement from the Science Committee of the British Council.

Partially digested materials are removed from the animals' digestive tracts either in the slaughter house or from specially prepared surgical openings in living specimens. Under the polarizing microscope, differences in light direction through the materials indicate digested and undigested parts.

The role of the bacteria is indicated when iodine is added. Where the bacteria are active, purple spots show the presence of starch-like substances, formed within the bacterial cells out of the cellulosic materials in the crude fiber. Apparently it is this bacterial starch that actually furnishes the nutrition to the animals.

Science News Letter, January 2, 1943

NCE FIELDS

AERONAUTICS

Sikorsky Receives Award For His Helicopter

➤ IGOR I. SIKORSKY, noted aircraft designer and engineering manager of the Vought-Sikorsky Aircraft Division of the United Aircraft Corporation, Stratford, Conn., is to receive the Sylvanus Albert Reed Award for 1942 in recognition of his contribution to aeronautics with a citation for his "creation and reduction to successful practice of a helicopter of superior controllability."

Ease of piloting the machine in all directions of flight, its ability to hover over one spot and to ascend and descend vertically, have been demonstrated many times. Mr. Sikorsky and others have pointed out the possibilities of the helicopter for public transportation in the post-war years.

The Institute of Aeronautical Sciences, which is presenting the award, has also elected Mr. Sikorsky an honorary fellow of the organization.

Science News Letter, January 2, 1943

NUTRITION

Meat Rationing Calls For Thrifty Purchasing

➤ WHEN MEAT rationing goes into effect, housewives must remember to be as thrifty with their ration stamp points as they were with their pennies during depression days, in order to get the most nourishment from their purchases.

Lean beef, lamb and veal have about the same nourishing value, although their point value may vary according to the national supply of each. So if roast beef takes more points than roast lamb, it is thriftier to buy the lamb, just as it would be thriftier to buy the lamb if its money cost were less.

Pork is somewhat of an exception. Lean pork has more of the vitamin B complex than other lean meats. Offsetting this advantage somewhat is the fact that pork requires long cooking which destroys some of these vitamins. Just how much vitamin value is lost in the cooking of pork has not been definitely established. Until it is established, the housewife can probably rely on point and penny thrift in selecting between pork, beef, veal and lamb, without worrying over the vitamin values.

Differences in cuts of meats should also be considered in purchasing with points, just as thrifty housewives have always considered the financial side of these differences. The rule here is that cheaper cuts, in money, are just as nourishing as more expensive ones, and this will probably also apply to cuts that are cheaper in points.

Most important to remember is that the unrationed meats, called variety meats or organ meats, have the highest all round nourishing value. Liver, kidneys, heart, sweetbreads and brains are included in this group.

Science News Letter, January 2, 1943

CHEMISTRY

TNT Used in Making Light-Sensitive Paper

➤ TNT CAN be used to shoot photographs as well as in blowups with high explosive bombs. The odd fact that TNT can be used as a light-sensitive coating for paper is reported by Dr. Walter O. Snelling, director of research for Trojan Powder Company, in the *PBOW News*, a publication issued at the Plum Brook Ordnance Works.

Dr. Snelling made the first photograph produced with TNT instead of the usual silver salts — a beautiful sepia-appearing portrait of Major Lewis K. Kallmyer, commanding officer.

It is not expected by Dr. Snelling, however, that TNT will be commonly used in photography. Importance of the experiment is in the information it provides about the handling and storing of the explosive.

That TNT could be used as a light-sensitive substance, was discovered by Dr. Snelling incidentally as he was studying the effect of light in darkening TNT. He found that when light acts on the TNT, it produces, in addition to the previously known reddish brown decomposition product, a volatile pink reaction product, the composition of which is unknown. This goes completely through filter paper and can be deposited on an underlying sheet of paper.

Dr. Snelling was successful in coating a suitable paper with a layer of TNT left by the evaporation of a solvent and used this as a photographic printing paper to produce the "sepia" portrait.

Science News Letter, January 2, 1943

METALLURGY

Color Changes Detect Traces of Metals

➤ COLOR CHANGES in the test tube will enable chemists to measure amounts of the silver-white metal, palladium, in solutions as dilute as 1 in 300,000,000 parts. The method was developed by Dr. John H. Yoe and co-workers at the University of Virginia.

This is the first procedure to be discovered which will detect such minute traces of the metal. It will be useful in analyzing and studying the platinum group of metals and their alloys. Palladium is used in dentistry, jewelry and to speed certain chemical reactions.

A new color method for detecting traces of iron as small as one part in 75,000,000 was also discovered, Dr. Yoe reports.

Analysis by weighing, rather than a color change, is the final step in a procedure developed at the University of Virginia to test tungsten ores and steels, an important metal in war production.

These investigations were part of a research program being conducted by Dr. Yoe and his associates to discover new and more sensitive organic analytical solutions for detecting and determining amounts of chemical elements and their compounds. Such studies have important applications not only in chemistry but also in medicine and biology.

Science News Letter, January 2, 1943

MILITARY SCIENCE

War Industries Protected Against Enemy Agents

➤ ENEMY agents have little chance to throw a monkey-wrench in America's war machinery as the government pushes its extensive program of plant protection, Lieut. Col. James C. Sawders, chief of the plant protection and safety branch of the Chemical Warfare Service, told the American Institute of Chemical Engineers.

Aliens are being hired in certain important war plants, but they must be investigated and approved by the Office of the Undersecretary of War, Col. Sawders explained. Most of them are found to be loyal citizens and trustworthy.

Infiltration of spies is avoided at all costs. Vital plant facilities are closely guarded and special attention is given to fire prevention, fencing and protective lighting, investigation of employees and protection of confidential documents, blueprints and special tools.

Science News Letter, January 2, 1943

GENERAL SCIENCE

What's Ahead for 1943

Science, of course, will contribute to more effective military weapons. It will also be devising new materials and processes for peace.

By WATSON DAVIS

➤ TO A WORLD at war, science in 1943 gives promise of new and more effective military weapons as well as new materials and processes that will serve both in war and in the days of peace to come.

In all likelihood new weapons fashioned by scientific research and development will be announced to the enemy in action before those on the home front know of their existence.

For the duration and for some time after, the details of any new devices of warfare developed by the methods of science will undoubtedly be kept secret just as at the present time many facts about many military devices are closely guarded.

For two years now there has been an intensive program of development of war weapons by Uncle Sam's special agencies created to do this job. Well over 125,000 inventions and suggestions for war use have been received by the National Inventors Council from the public. The new Office of Production Research and Development within the War Production Board is just getting underway and during the year 1943 will tackle some of the important and troublesome war-born problems of production, such as whether we need for war purposes to develop new processes for making aluminum from clay, or iron from low-grade ores. Just as production for war is hitting its stride, so scientific research for war may be expected to be setting a speedy pace behind the scenes of our military effort.

Protection Against Epidemics

In our war against disease, which must be fought more intensively now than ever before, new methods of protection against epidemics are being developed. Most important has been the great extension of protective vaccines and serums and their use upon great masses of men in the armed services. Tetanus and yellow fever have joined smallpox and the typhoids as diseases that cannot make headway among our troops, thanks principally to such protective measures.

The public, through donation of blood to the Red Cross for use as the dried plasma for treating shock in battle casualties, has been able to play its part in keeping our forces fit to fight. Researches under way may result in coming months in use of substances from animal blood for such life-saving, but at present human blood is needed in increasing quantities.

If epidemics of influenza or other airborne diseases threaten during 1943, there will be extensive trials of new methods of air sterilization. These include spraying into the air a fine mist of propylene glycol or irradiating with ultraviolet light. If influenza or some other respiratory disease plagues us, there is greater chance that the after effects or the illness itself can be treated successfully with some of the sulfa drugs which have had such extensive and striking use on the pneumonias.

Cures from Evil

From the earth itself have come new chemicals, manufactured by the teeming billions of bacteria in the soil, that surpass even the sulfa drugs in their conquests over disease germs. Watch particularly penicillin and gramicidin, two of these soil chemicals. From clinical studies now well along it seems that they will prove as useful in the treatment of chronic infections, such as the common sinus troubles, as have the sulfa drugs in controlling acute infections.

Urea is likely to come into greater use in the dressing of wounds, and you may expect to see an extension of the use of dicoumarol, obtained from sweet clover, in the treatment of diseases of which a manifestation is undesirable clotting of the blood.

The stress of war is likely to affect the mental health of both our fighting men and the civilian population. Psychiatrists expect to see more neuroses and psychoses precipitated by the conditions of 1943.

Many more women will take up the work of industries during the coming year. Because many of these women are the mothers of small children who need care while they work, there will be more nursery schools and day nurseries established. This will give a new impetus to the study of child development, particularly under what conditions children get the best chance to grow up into useful citizens. This new social and economic status for women will persist after the war and our culture will become still more technological, emphasizing the importance of knowing about the best conditions for early child development.

Dehydrated Foods

Dehydration of food will be practiced on an increasing scale both because of the shipping space saved in sending food overseas and because of the shortage of steel and tin for the canning industry. As more kinds of foods are rationed in order that all may have what they need, there will be increased attention given to the enrichment of food with synthetic products and the production of such products.

The most powerful X-rays man has ever created, generated by means of a new electron generator whirling electrons up to 100,000,000 volts, will give science a new tool for inspecting large metal castings and also experimenting with radiation that approaches the power of the cosmic rays.

The new electron microscopes now available for industrial and medical laboratories may be expected to give new and perhaps startling results during the year.

Because of the accelerating tempo of the war, the construction of airplanes and their equipment may be the greatest industry in the United States in 1943, both as to manpower and expense. We shall undoubtedly have reports from the fighting fronts of the use of bombers of longer range and greater bomb capacity. Fighters will mount cannon for use in low level attacks against tanks, locomotives and other ground objectives. There will be an increasing and vitally important volume of freight transported overseas by air. In the structure of airplanes, magnesium metal will be employed as welded sheets and shapes.

In man's study of the heavens, astronomers will continue to solve some of the puzzles of the universe. There will be new theories and interpretations

of the development of the spiral galaxies, those great universes of stars far outside our own galaxy. Further progress is foreseen in the study of stellar evolution, which is undergoing a revival, and there will be interpretations of those peculiar variable stars whose varying light does not follow the usual patterns. On Feb. 4 there will be a total eclipse of the sun that will extend over the far-flung battle zones of the area north of Japan, the Aleutians and Alaska. Although totality lasts for eight-tenths of a minute at Anchorage, Alaska, near sunset, it is unlikely that there will be any extensive expeditions to observe it.

Anthropologists and archaeologists can do little or no field work these days in digging up past civilizations or studying strange peoples in various parts of the world. But they are hard at work summarizing for war purposes all that is known about our enemies in order that this information may be used in fighting the war. It is particularly important to do this for the Japanese, although data on the Germans as well will be useful in the post-war years when the United Nations forces will need the greatest possible amount of factual help in setting the world to order and in handling the problems of peoples whose minds and feelings have been indoctrinated with false science and ideals.

The shape of the future after our military victory is won will gradually emerge during the year. Scientists will find themselves particularly concerned with the major problems of raw materials, regarding peoples and commerce that must be solved to keep the world free, peaceful and contented, as well as fed, clothed and housed.

Science News Letter, January 2, 1943

NUTRITION

Tests for Coffee

➤ SIMPLE TESTS for telling whether the coffee you brought home on your precious number 27 coupon has been adulterated are given by C. E. Shepard, chemist of the Connecticut Agricultural Experiment Station.

Examination of coffee samples recently submitted to the station showed one of them to be almost 50% impure. A flat taste or lack of kick may be, as coffee drinkers often suspect, signs of adulteration.

Chicory is the most common adulterant of coffee, Mr. Shepard stated. One test for detecting chicory in ground coffee is made by placing a good pinch of the material on a piece of white paper. Examine the individual particles with a hand lens, though you can tell the difference between coffee and chicory without this aid. Coffee grounds are usually light brown and granular, while those of chicory, being made from a root, are fibrous and darker in color.

The "water test" shows up the difference even more distinctly. Half a teaspoonful of coffee is placed in a glass a quarter full of water. Most of the true coffee will stay on top for a time, but grains of chicory or other fibrous vegetable material quickly become waterlogged and sink to the bottom, often coloring the water brownish. After allowing the material to soak for ten minutes, the water is drained off, and the grains spread out in a dish or on a piece of white paper. If, on prodding with a match stick or tweezers, a granule appears hard and resistant and "jumps away", it most likely is coffee. But if it is plastic, almost like gelatin in consistency, it is a foreign substance, probably chicory.

Chicory is made from the root of a perennial vegetable grown in the Northeast. Addition of chicory or any other harmless vegetable material to coffee is not considered illegal, Mr. Shepard points out, so long as its presence is plainly indicated on the package label. Some people prefer coffee that contains a little chicory and even add it themselves. Most consumers, however, want only pure coffee, and a mixture of coffee and other materials should be sold for what it is.

Science News Letter, January 2, 1943

ENGINEERING

Ship Models Are Tested For Wartime Research

➤ SMALL TOY-LIKE ships and naval equipment are being built in increasing numbers by the nation's gigantic shipyards.

They're expensive luxuries, thought some of the old-time shipbuilders. But marine engineers find them a quick and economical way to discover how our seagoing vessels may be improved, reports S. B. Besse, model engineer, of Newport News, Va.

NOT JUST FUN—This little boat is a model being tested at the forty-foot model basin of the Newport News Shipbuilding and Dry Dock Company. Such tests result in the improvement of sea-going vessels. The photograph is from the U. S. Maritime Commission.

Engineers are shown testing a model in the official photograph from the U. S. Maritime Commission shown on this page.

Arrangement models help determine the best possible location of compartments and equipment. Government contracts often require machinery room models before actual construction of large naval craft.

Development of intricate structures that are hard to visualize from plans, is aided by design models.

Planning models are used in general yard work, where heavy and bulky equipment must be handled, as well as for construction purposes.

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Nylon brushes, resembling over-sized bottle brushes, are used to clean Navy guns.

From Page 4

ised greatest success. The aim of the scientist in general was to discover natural laws. He therefore carried on his experiments in such a way as to find the natural laws, for that is what he was looking for. He was best able to accomplish this by working with phenomena which depended upon the behavior of enormous numbers of atoms rather than upon individual atoms. In this way the effects produced by individual atoms averaged out and became imperceptible. We have many familiar examples of this effect of averaging: the deaths of individual human beings can not usually be predicted, but the average death rate in any age group is found to come close to expectation.

Atom Is Unpredictable

Since the discovery of the electron and the quantum and methods of detecting or even counting individual atoms, it has been possible for scientists to undertake investigations of the behavior of single atoms. Here they have found unmistakable experimental evidence that these phenomena depend upon the laws of probability and that they are just as unpredictable in detail as the next throw of a coin. If, however, we were dealing with large numbers of such atoms the behavior of the whole group would be definitely determined by the probability of the individual occurrence and therefore would appear to be governed by laws of cause and effect.

Just as there are two types of physics, classical physics and quantum physics which have for nearly 25 years seemed irreconcilable, just so must we recognize two types of natural phenomena. First, those in which the behavior of the system can be determined from the average behavior of its component parts and second, those in which a single discontinuous event (which may depend upon a single quantum charge) becomes magnified in its effect so that the behavior of the whole aggregate does depend upon something that started from a small beginning. The first class of phenomena I want to call convergent phenomena, because all the fluctuating details of the individual atoms average out giving a result that converges to a definite state. The second class we may call divergent phenomena, where from a small beginning increasingly large effects are produced. In general then we may say that classical physics applies satisfactorily to convergent phenomena and that they conform well to the older ideas of cause and effect. The divergent phenomena, on the other hand, can best be understood on the basis of quantum theory of modern physics.

Let me give some illustrations of divergent phenomena. The wonderful cloud chamber experiments of C. T. R. Wilson show that a single high speed electron, or an alpha particle from an atom of radium, in passing through a gas leaves a trail of ions. By having moisture in the gas and by causing the gas to expand just after these ions are produced, drops of water are made to condense on the ions. By a strong illumination it thus becomes possible to see or photograph this track of ions as a white line on a dark background. The time at which an alpha particle will be emitted from a radium atom is inherently unpredictable. It would be totally contrary to the teachings of modern physics to suppose that our inability to predict such an event is merely due to our ignorance of the conditions surrounding the particular atom. The uncertainty principle requires that even if these conditions were absolutely fixed the time of emission and the direction of emission of the alpha particle are subject to the laws of chance and thus for a single particle are unpredictable.

May Alter History

The occurrences in the Wilson cloud chamber following the disintegration of a single radium atom are typical divergent phenomena. The single quantum event led to the production of countless thousands of water droplets and these made the track of the alpha particle visible and led to its reproduction in a photograph. This track may show some unusual feature of particular interest to the scientist. For example, it may have a kink which indicates that the alpha particle collided with the nucleus in one of the molecules of gas. The photograph may therefore be published—may start discussions among scientists that involve thousands of man hours—may delay one of them so that he misses a train on which he might otherwise have suffered a fatal accident. Examples of this kind, any number of which could be given, show that it is possible for single unpredictable quantum events to alter the course of human history.

The formation of crystals on cooling a liquid involves the formation of nuclei or crystallization centers that must originate from discrete, atomic phenomena. The spontaneous formation of these nuclei often depend upon chance.

At a camp at Lake George, in winter, I have often found that a pail of water is unfrozen in the morning after being in a room far below freezing but it suddenly turns to slush upon being lifted from the floor.

Glycerine is commonly known as a viscous liquid, even at low temperatures. Yet if crystals are once formed they melt only at 64 degrees F. If a minute crystal of this kind is introduced into pure glycerine at temperatures below 64 degrees the entire liquid gradually solidifies.

During a whole winter in Schenectady I left several small bottles of glycerine outdoors and I kept the lower ends of test tubes containing glycerine in liquid air for days but in no case did crystals form.

My brother, A. C. Langmuir, visited a glycerine refinery in Canada which had operated for many years without ever having any experience with crystalline glycerine. But suddenly one winter, without exceptionally low temperatures, the pipes carrying the glycerine from one piece of apparatus to another froze up. The whole plant and even the dust on the ground became contaminated with nuclei and although any part of the plant could be temporarily freed from crystals by heating above 64 degrees it was found that whenever the temperature anywhere fell below 64 degrees crystals would begin forming. The whole plant had to be shut down for months until outdoor temperatures rose above 64 degrees.

Here we have an example of an inherently unpredictable divergent phenomenon that profoundly affected human lives.

Every thunderstorm or tornado must start from a small beginning and at least the details of the irregular courses of such storms across the country would be modified by single quantum phenomena that acted during the initial stages. Yet small details such as the place where lightning strikes or damage occurs from a tornado may be important to a human being.

Heredity and Evolution

Still more obvious examples of divergent phenomena which affect human life are those involved in the mechanism of heredity and the origin of species. Whether the genes are inherited from the mother or from the father seems to be fundamentally a matter of chance, undoubtedly involving changes in single atoms. It is known definitely that changes in genes or mutations can be produced by X-rays and it has even

been proved that a single quantum is sufficient to bring about such an alteration. The growth of any animal from a single cell is a typical illustration of a divergent phenomenon. The origins of species and all evolutionary processes involving as they do natural selection acting upon mutations, must depend at almost every stage upon phenomena which originate in single atoms.

An idea that develops in a human brain seems to have all the characteristics of divergent phenomena. All through our lives we are confronted with situations where we must make a choice and this choice may sometimes alter the whole future course of our lives.

Will Affect Thought

As the implications of the uncertainty principle, especially as applied to divergent phenomena, are more generally recognized the limitation of the idea of causality should have profound effects on our habits of thought. The science of logic itself is involved in these changes. Two of the fundamental postulates of logic are known as the law of uniformity of nature, and the law of the excluded middle. The first of these laws is equivalent to the postulate of causality in nature. The second law is simply the familiar postulate that a given proposition must be either true or false. In the past these so-called laws have formed the basis of much of our reasoning. It seems to me, however, that they play no important part in the progress of modern science. The cause and effect postulate is only applicable to convergent phenomena. The second postulate in assuming that any proposition must be true or false implies that we attach absolute meanings to words or concepts. If concepts have meanings only in terms of the operations used to define them we can see that they are necessarily fuzzy. Take for example this statement, "atoms are indestructible." Is this true or false? The answer depends upon what aspect of atoms is considered. To the chemist the statement is as true as it ever was. But a physicist, studying radioactive changes, recognizes that some atoms undergo spontaneous disintegration or destruction. The fact is that the chemist and the physicist have no exact definitions of the word atom and they also do not know in any absolute sense what they mean by indestructible.

Fortunately such questions no longer occupy much of the time of scientists, who are usually concerned with more concrete problems which they are endeavoring to treat in common sense ways.

It is often thought by the layman, and many of those who are working in so-called social sciences, that the field of science should be unlimited. That reason should take the place of intuition, that realism should replace emotions and that morality is of value only so far as it can be justified by analytical reasoning.

Human affairs are characterized by a complexity of a far higher order than that encountered ordinarily in the field of science.

To avoid alternating periods of depression and prosperity economists propose to change our laws. They reason that such a change would eliminate the cause of the depressions. They endeavor to develop a science of economics by which sound solutions to such problems can be reached.

I believe the field of application of science in such problems is extremely limited. A scientist has to define his problem and usually has to bring about simplified conditions for his experiments which exclude undesired factors. So the

economist has to invent an "economic man" who always does the thing expected of him. No two economists would agree exactly upon the characteristics of this hypothetical man and any conclusions drawn as to his behavior are of doubtful application to actual cases involving human beings. There is no logical scientific method for determining just how one can formulate such a problem or what factors one must exclude. It really comes down to a matter of common sense or good judgment. All too often wishful thinking determines the formulation of the problem. Thus, even if scientifically logical processes are applied to the problem the results may have no greater validity than that of the good or bad judgment involved in the original assumptions.

May Have Vital Importance

When we consider the nature of human affairs it is to me obvious that divergent phenomena frequently play a role of vital importance. It is true that some of our historians cynically taught most of our college students from 1925 to 1938 that wars, the rise and fall of nations, etc. were determined by nearly cosmic causes. They tried to show that economic pressure, and power politics on the part of England or France, etc. would have brought the same result whether or not Kaiser Wilhelm or Hitler or any other individual or group of individuals had or had not acted the way they did. Germany, facing the world in a realistic way, was proved, almost scientifically to be justified in using ruthless methods—because of the energy and other characteristics of the German people they would necessarily acquire and should acquire a place in the sun greater than that of England, which was already inevitably on the downward path.

I can see no justification whatever for such teaching that science proves that general causes (convergent phenomena) dominate in human affairs over the results of individual action (divergent phenomena). It is true that it is not possible to prove one way or the other that human affairs are determined primarily by convergent phenomena. The very existence of divergent phenomena almost precludes the possibility of such proof.

The mistaken overemphasis on convergent phenomena in human affairs, and the reliance on so-called scientific methods, has been responsible in large degree for much of the cynicism of the last few decades.

The philosophy which seems to have made the German people such willing aggressors is allegedly based upon scientific realism. Almost any system of morality or immorality could receive support from the writings of Nietzsche, so inconsistent are they with one another. But his teachings, which purport to be based on the laws of natural selection, have led in Germany to a glorification of brute strength, with elimination of sympathy, love, toleration and all existing altruistic emotions.

Darwin, himself, however, recognized that the higher social, moral and spiritual developments of mankind were factors which aided in survival. Natural selection is often referred to loosely as the law of the survival of the fittest. The concept of fitness seems, however, inherently rather fuzzy. Apparently these individuals are fittest which possess characteristics that increase the probability that they shall survive.

Realists' Arguments

We often hear realists deplore the effects of charity which tend to keep the unfit alive. We are even told that the whole course of evolution may be revised in this way. Similar arguments could be used against the surgeon who removes an appendix or a doctor who uses a sulfa drug to cure pneumonia.

But what is the need of developing a race immune to appendicitis or pneumonia if we possess means for preventing their ill effects. The characteristics that determine fitness merely change from those of immunity to those which determine whether a race is able to provide good medical treatment.

The coming victory of the United Nations will prove that survival of the nation may be prevented by an aggressive spirit, by a desire to conquer or enslave the world, or by intolerance, ruthlessness and cruelty. In fact there is no scientific reason why decency and morality may not prove to be vastly more important factors in survival than brutal strength.

Must Plan for Future

In spite of the fact that we can no longer justify a belief in absolute causation and must recognize the great importance of divergent phenomena in human life we still have to deal with causes and effects. After all we must plan for the future. We can do this, however, by estimating probabilities even where we do not believe that definite results will inevitably follow. When our Army lands in North Africa its probable success depends on the carefulness of the preparations and the quality of the strategy. But no amount of foresight can render success absolutely certain.

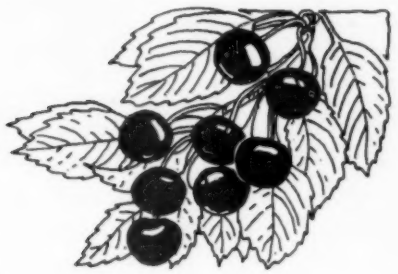
It does not seem to me that we need be discouraged if science is not capable of solving all problems even in the distant future. I see no objection to recognizing that the field of science is limited.

In the complicated situations of life we have to solve numerous problems and make many decisions. It is absurd to think that reason should be our guide in all cases. Reason is too slow and too difficult. We often do not have the necessary data. Or we cannot simplify our problem sufficiently to apply the methods of reasoning. (*turn to next page*)

AGRICULTURE

NATURE RAMBLINGS

by Frank Thone



Oils From Kernels

➤ REMEMBER how you saved prune pits during the first World War? If you were in the Army, you had to, Buddy; the corporal at the end of the mess table saw to that!

It looks now as if fruit pits and stones are going to be put to use again, though in a different way and for another purpose. What they wanted, back in 1917-18, was the shells, for gas mask charcoal. They have plenty of that now.

What's wanted in this new World War are the kernels within the pits, for the oil they contain. Such special oils as sweet almond oil, formerly imported, are on the list of war shortages now, and the oils from apricot, peach and cherry kernels resemble this rather closely. Prune-kernel oil would do nicely, too, but not many prunes are pitted at the processing plants.

It is not likely that housekeepers, restaurant owners and mess officers will be asked to save fruit pits this time. It is easier and far less expensive to go to the concentrated, quantity sources, the canneries and fruit-drying plants, where fruit pits have long been a useless waste, fit only for burning under the boilers. In normal times, the expense of cracking the pits and extracting and refining the oils has been too great, but with the price of oils much higher it seems worth while to install the necessary machinery.

Another source of vegetable oil that is recommended for industrial attention is the avocado. This fatty fruit has been steadily gaining in favor during recent decades, but as yet there is no really good, paying outlet for the disposal of culls and damaged fruits. Avocado oil is very much like olive oil in quality and flavor. Incidentally, despite the large quantities of olives raised in the West, domestic olive oil has never supplied more than 5% of the American market.

So-called rice bran oil has also received comparatively little attention. If ways can be found to prevent it from turning rancid, it has possibilities, Department of Agriculture chemists say, as a substitute for the now scarce vitamin-rich sardine oil in animal feeds.

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What then must we do? Why not do what the human race always has done—use the abilities we have—use common sense, judgment and experience. We often underrate the importance of intuition.

In almost every scientific problem which I have succeeded in solving, even those that have involved days or months of work, the final solution has come to my mind in a fraction of a second by a process which is not consciously one of reasoning. Such intuitive ideas are often wrong. The good must be weeded out from the bad—sometimes by reasoning. The power of the human mind is far more remarkable than one ordinarily thinks. We can often size up a situation, or judge the character of a man by the expression of his face or by his acts in a way that would be quite impossible to describe in words.

People differ greatly in their ability to reach correct conclusions by such methods. Our superstitions and the present popularity of astrology prove how often our minds make blunders. Since we have to live with our minds, however, we should train them, develop them, censor them—but let us not restrict them by trying to regulate our lives solely by science or by reason.

Our morality is a kind of summation of the wisdom and experience of our race. It comes to us largely through tradition or religion. Some people justify evil things on the basis of morality—but by and large a recognition of right and wrong, even if these concepts are sometimes fuzzy, has proved to be of incalculable value to mankind. The philosophical, metaphysical or even scientific analysis of the principles of ethics has not proved particularly fruitful. A sense of morality and decency, although not scientific, may be a major factor in winning the war.

Science News Letter, January 2, 1943

• New Machines and Gadgets •

⚙ *COOKING LARGE quantities of meat by an electric current is now possible by using an electric conductance device recently patented. Regulation of cooking speed and avoidance of immersing the meat in an electrolytic solution overcome objections which the inventor claims were present in similar devices used in the past for small-scale cooking, such as frankfurters.*

Science News Letter, January 2, 1943

⚙ *GLASS FIBER thermal insulating wool is being used to absorb sound in test units for plane engines. Testing as many as a dozen engines at one time presents acoustical problems due to great volume of sound, high-wind velocities and complex sound patterns. The glass fiber not only prevents deafness among workers but avoids annoyance to others in the neighborhood.*

Science News Letter, January 2, 1943

⚙ *A PLASTIC petroleum, for lubricating the magazines of marine anti-aircraft guns, has been developed for use either in freezing Icelandic waters or in the hot Pacific, and which prevents salt water from rusting the metal.*

Science News Letter, January 2, 1943

⚙ *A THERMOPLASTIC material capable of replacing steel and other scarce metals has been added to the growing family of resin-treated laminated paper products. It is said to be tough and sturdy but lightweight, with low water absorption.*

Science News Letter, January 2, 1943

⚙ *A PILL BOX which dispenses only one pill at a time has been recently patented. One pill at a time pops from a small opening in the molded, pocket-size container, the remainder being inaccessible and protected from dust and other contamination.*

Science News Letter, January 2, 1943

⚙ *NAVY GOGGLES have unusual light control features. The polarizing lenses filter out reflected glare and sunburn rays and can be rotated by a control button to admit or exclude as much light as desired. They are now in mass production for use to conserve and sharpen the eyesight of America's embattled sailors.*

Science News Letter, January 2, 1943

⚙ *A FLASHLIGHT for fishermen which can be held in the mouth while using both hands to bait a hook, and might also come in handy for hunting a collar button during a blackout, has recently been patented.*

Science News Letter, January 2, 1943

⚙ *SINUS sufferers may soon wear their heat treatment to bed with them. An electrically heated mask has recently been patented for this purpose.*

Science News Letter, January 2, 1943

If you want more information on the new things described here, send a three-cent stamp to SCIENCE NEWS LETTER, *1719 N St., N. W., Washington, D. C., and ask for Gadget Bulletin 136.*

• Just Off the Press •

AIRPLANE DESIGN MANUAL—Frederick K. Teichmann—*Pitman*—440 p., illus., $4.50. Revised edition. Technical.

CHILDREN'S CENTERS—A Guide for Those Who Care For and About Young Children—Rose H. Alschuler, ed.—*Morrow*, 168 p., illus., $1.50. Issued by National Commission for Young Children. A practical and timely book in a day when parents are more and more engaged in the war effort.

THE CRAYFISHES OF FLORIDA—Horton H. Hobbs, Jr.—*Univ. of Florida*—180 p.,—24 plates, $2.25. Biological Science Series, vol. III, no. 2.

DISTRIBUTION AND VARIATION OF THE HAWAIIAN TREE SNAIL ACHATINELLA APEXFULVA DIXON IN THE KOOLAU RANGE, OAHU—D'Alté A. Welch—*Smithsonian Institution*—236 p., illus., $1.

EXPLORING FIELD MUSEUM—*Field Museum of Natural History*—84 p., illus., 60. Exhibits from each department in the museum, illustrated with nice color photographs, and described with brief text.

THE FOOD YOU EAT: A Practical Guide to Home Nutrition—Samuel and Violette Glasstone—*Univ. of Oklahoma Press*, 277 p., $2.25.

HOW TO READ BLUEPRINTS—W. Clyde Lammey—*Popular Mechanics Press*—96 p., illus., $1.50.

INTERNATIONAL ECONOMIC DEVELOPMENT PUBLIC WORKS AND OTHER PROBLEMS—Lewis L. Lorwin—*Govt. Print. Office*—111 p., 30c. National Resources Planning Board.

MATHEMATICAL RECREATIONS — Maurice Kraitchik—*Norton*, 329 p., illus., $3.75.

MATHEMATICS FOR MECHANICS—William L. Schaaf—*Garden City*, 298 p., illus., $2. Arithmetic through shop trigonometry.

MEDICAL RELIEF IN EUROPE: Questions for Immediate Study—Melville D. MacKenzie—*Oxford Univ. Press*, 67 p., 70c. Post-war problems.

THE NATURAL-HISTORY BACKGROUND OF CAMOUFLAGE — Herbert Friedmann — *Smithsonian Institution*—17 p., illus. Free upon direct application Smithsonian Institution. (Smithsonian Institution War Background Studies Number Five.)

THE OCEANS: Their Physics, Chemistry, and General Biology—H. U. Sverdrup, Martin W. Johnson, and Richard H. Fleming—*Prentice-Hall*, 1087 p., illus., $10. Text edition, $8.

ORIGIN MYTH OF ACOMA AND OTHER RECORDS—Matthew W. Stirling—*Govt. Print. Off.*, 123 p., 17 plates, 35c. Smithsonian Institution Bureau of American Ethnology, Bulletin 135.

THE PLANT COMMUNITIES OF THE WELAKA AREA: With special reference to correlations between soils and vegetational succession—Albert Middleton Laessle—*Univ. of Florida*—143 p., illus., $1.50.

THE PRACTICAL OUTLINE OF MECHANICAL TRADES FOR HOME STUDY—William L. Schaaf, ed.—*Garden City*, 954 p., illus., $3.95. Covers mathematics from arithmetic through shop trigonometry; mechanical drawing; applied physics; practical chemistry; machine elements and machine shop practice; woodworking; and electrical trades.

QUESTIONS AND ANSWERS FOR MARINE ENGINEERS: Book I: Boilers — H. C. Dinger—*Simmons-Boardman*—168 p., $1.

QUESTIONS AND ANSWERS FOR MARINE ENGINEERS: Book II—Engines—H. C. Dinger—*Simons-Boardman*, 186 p., illus., $1.

RELIEF FOR EUROPE—National Planning Association—*National Planning Ass'n*—59 p., 25. (Planning Pamphlets No. 17.)

REPORT OF THE COMMITTEE ON THE MEASUREMENT OF GEOLOGIC TIME 1941-1942—*National Research Council*—68 p., 50c.

A SKULL OF BISON LATIFRONS FROM THE PLEISTOCENE OF NORTHERN CALIFORNIA—V. L. Vanderhoof—*Univ. of California Press*—17 p., 2 plates—illus., 35c.

A START IN METEOROLOGY: An Introduction to the Science of the Weather—Armand N. Spitz—*Henley*, 95 p., illus., $1.50. For young people.

STUDIES OF CENOZOIC VERTEBRATES OF WESTERN NORTH AMERICA AND OF FOSSIL PRIMATES—Arthur B. Drescher and others — *Carnegie Institution* — 222 p., illus., $2.25 paper cover, $2.75 cloth.

SYSTEMATICS AND THE ORIGIN OF SPECIES Ernst Mayr—*Columbia Univ. Press*—334 p., illus., $4.

A WORLD TO LIVE IN—Leland D. Case—*Rotary International*—96 p., 25c. Cheaper in lot numbers from the Rotarian Magazine. Selected articles from the Rotarian magazine.